Problem 1 (5 marks)

Simplifying $O(3m^4 + m^3)$ yields: Answer: 2

1. $O(3m^4 + m^3)$
2. $O(m^4)$
3. $O(4m^7)$
4. $O(m^3)$

Problem 2 (5 marks)

e^n \in \Omega(5\log n) Answer: 1

1. True
2. False

Problem 3 (5 marks)

$n \log n \in o(n^2)$ Answer: 1

1. True
2. False

Problem 4 (5 marks)

$O(\frac{n^3}{3n \times 3n^2})$ is equal to: Answer: 1

1. $O(1)$
2. $O(n)$
3. $O(n^3)$
4. None of the above
Problem 5 (5 marks)

\(O((4n^{3/2} + 2n) \times (n - n^{1/2}))\) is equal to: Answer: 3

1. \(O(n^2)\)
2. None of the other answers
3. \(O(\sqrt{n^5})\)
4. \(O(4(n^{5/2} - n^2))\)

Problem 6 (5 marks)

A heuristic evaluation function which is bounded above by a cost function is called: Answer: 4

1. good
2. optimal
3. inadmissible
4. admissible

Problem 7 (5 marks)

A heuristic search algorithm Answer: 1,2,3

1. is oxymoronic (paradoxical)
2. may be susceptible to local optima
3. is sometimes faster than exhaustive search
4. always grows subexponentially in time complexity

Problem 8 (5 marks)

The following are strategies for escaping local optima in greedy search: Answer: 1,3,4

1. Random restarts
2. Multiplying \(h\)
3. Averaging \(h\) over a local region
4. Lookahead search
Problem 9 (5 marks)

There is a homomorphism from \( \langle \{0, 1\}, \lor, \text{On} \rangle \) to \( \langle \mathbb{N}, +, \text{Odd} \rangle \). Answer: 2

1. True
2. False

Problem 10 (5 marks)

How is continuous time represented in Discrete Event Simulation? Answer: 2

1. It isn’t
2. By varying additions to time induced by event completions
3. By stepping a clock
4. None of the above

Problem 11 (10 marks)

Using permutations of city labels (numbers) to represent candidate solutions to TSP, write a pseudo-code algorithm to enumerate the search space. Write its best case and worst case time complexity using \( \Omega \) and \( O \), respectively.

Problem 12 (10 marks)

Using permutations of city labels (numbers) to represent candidate solutions to TSP, write a pseudo-code algorithm to perform a greedy search of this search space. Write its best case and worst case time complexity using \( \Omega \) and \( O \), respectively.

Problem 13 (5 marks)

All NP-Hard problems are NP-Complete. Answer: 2

1. True
2. False
Problem 14 (5 marks)

If $P=NP$, then all problems are polynomial time. Answer: 2

1. True
2. False

Problem 15 (10 marks)

The closed form of

$$\sum_{1 \leq i \leq n} 2^i$$

is: Answer: 3

1. $2^{n+1} - 1$
2. $\frac{n(n+1)}{2}$
3. $2^{n+1} - 2$
4. None of the above

Problem 16 (10 marks)

The closed form of

$$\sum_{1 \leq i \leq n} i2^i$$

is: Answer: 2

1. $(n - 1)2^{n+1} - 2$
2. $(n - 1)2^{n+1} + 2$
3. $2^{n+1} - 2$
4. None of the above